

# **CHRISTOPHER A. SHUMAN**

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## **ACTIVITY**

2007-Present - Associate Research Scientist, Goddard Earth Science and Technology Center, University of Maryland, Baltimore County at Planetary Geodynamics Branch, NASA Goddard Space Flight Center, Greenbelt MD.

2001-2007 - Physical Scientist, Cryospheric Sciences Branch, and Deputy Project Scientist for the ICESat Mission (2001-2005), Greenbelt, MD and Adjunct Research Faculty, ESSIC, University of Maryland, College Park.

1999-2001 - Assistant Research Scientist, Earth System Science Interdisciplinary Center, University of Maryland, College Park, Dr. Antonio J. Busalacchi, Director.

1996-1998 - Visiting Research Fellow, Universities Space Research Association, NASA Goddard Space Flight Center, Oceans and Ice Branch, Greenbelt, MD with Dr. Robert A. Bindshadler.

1994-1996 - National Research Council, Resident Research Associate, NASA Goddard Space Flight Center, Oceans and Ice Branch, Greenbelt, MD working with Dr. Robert A. Bindshadler.

1992-1994 - Research Associate, Earth System Science Center and Department of Geosciences, The Pennsylvania State University, University Park, PA working with Dr. Richard B. Alley.

## **EDUCATION**

Ph.D. Geosciences 1992, The Pennsylvania State University, Advisor: Dr. R.R. Parizek.

M.S. Geology 1987, The Pennsylvania State University, Advisor: Dr. R.R. Parizek.

B.S. Geology 1982, Moravian College, Advisor: Dr. J.J. Gerencher, Jr.

## **FUNDING HISTORY**

Co-Investigator, NASA IIP, Push-broom Laser Altimeter Demonstration for Space-based Cryospheric Mapping, with D.J. Harding PI, NASA Portion is \$2,714,800K over three years after cost sharing.

Co-Investigator, NASA Oceans and Ice NRA-04-OES-02, "At-Risk" Ice Shelves and Outlet Glaciers in Antarctica: Using Satellite Data to Evaluate Responses to a Changing Climate, with T. Scambos PI, NASA Portion is \$61,400 over three years after cost sharing.

Co-Investigator, NASA Oceans and Ice NRA-04-OES-02, Quantification of the Current State of Ice Caps and Outlet Glaciers in the North Atlantic, Rate of Change and their Vulnerability to Climate Change, with D. Hall PI, NASA portion is \$599,100 over three years after cost sharing.

Co-Investigator, National Science Foundation Grant, OPP-0125960, Collaborative Research: Characteristics of Snow Megadunes and their Potential Effects on Ice Core Interpretation, with T. Scambos, M. Fahnestock, and M. Albert, NASA portion is \$74,712 over three years.

Co-Investigator, NASA 01-OES-03 Grant, Multi-sensor measurements of the temporal and spatial pattern of ice-sheet accumulation, with R.A. Bindshadler and M. Fahnestock, NASA portion is \$342,400 over three years.

Co-Investigator, National Science Foundation Grant OPP-9815200, Stable isotope studies at West Antarctic ITASE sites with E.J Steig and J.W.C. White (\$266,367 over five years).

Co-Investigator, NASA EOS-IDS Grant 1996-MTPE-00027, Interdisciplinary determination of snow accumulation patterns on the Greenland ice sheet: Combined atmospheric modeling and field and remote sensing studies with R.A. Bindschadler (\$280,000 over four years).

Co-Investigator, National Science Foundation Grant OPP-9526566, Passive Microwave Remote Sensing for Paleoclimate Indicators at Siple Dome, Antarctica with R.A. Bindschadler (\$140,143 over three years).

## PUBLICATIONS

**Shuman, C.A.**, T.A. Scambos, W.B. Krabill, R.A. Thomas, A. Rivera, G. Casassa, C. Hulbe, C.F. Martin, J. Bohlander, and V.P. Suchdeo (in prep.), Significant thinning of Crane Glacier 2002-2008, Larsen B Embayment, Antarctica, *Geophysical Research Letters*.

**Shuman, C.A.**, D.K. Hall, R.S. Williams, Jr., O. Sigurðsson and J.F. Jónsdóttir, (in prep.) Detection of surface-elevation change on Drangajökull, Iceland, *Annals of Glaciology*.

**Shuman, C.A.**, M.A. Fahnestock, T. Scambos, R. Bauer, T. Haran, M. Albert (in prep). Antarctic megadunes – Form and scale, *Journal of Geophysical Research*.

Humbert, A., T.A. Scambos, and **C.A. Shuman** (in prep.). The beauty and complexity of the Brunt Ice Shelf from MOA and ICESat, *Journal of Glaciology*.

Hanna, E., P. Huybrechts, K. Steffen, J. Cappelen, R. Huff, **C.A. Shuman**, T. Irvine-Fynn and S. Wise (2008), Increased runoff from melt from the Greenland Ice Sheet: a response to global warming?, *Journal of Climate*, vol. 21/2, pp. 331-341, DOI: 10.1175/2007JCLI1964

Bell, R.E., M. Studinger, **C.A. Shuman**, M.A. Fahnestock, and I. Joughin, (2007), Large subglacial lakes in East Antarctica at the onset of fast-flowing ice streams, *Nature*, vol. 445, pp. 904-907, doi:10.1038/nature05554.

Courville, Z.R., M.R. Albert, M.A. Fahnestock, L.M. Cathles, and **C.A. Shuman** (2007), Impacts of an accumulation hiatus on the physical properties of firn at a low-accumulation polar site, *Journal of Geophysical Research*, 112, F02030, doi:10.1029/2005JF000429

Koenig, L.S., E.J. Steig, D.P. Winebrenner and **C.A. Shuman** (2007), A link between microwave extinction length, firn thermal diffusivity and accumulation rate in West Antarctic. *Journal of Geophysical Research*, 112(F3), F03018, doi:10.1029/2006JF000716.

**Shuman, C.A.**, H.J. Zwally, B.E. Schutz, A. Brenner, R. J. DiMarzio, H.A. Fricker, and V.P. Suchdeo (2006). ICESat Antarctic Ice Sheet elevations - Preliminary precision and accuracy assessments, *Geophysical Research Letters*, 33, L07501, doi:10.1029/2005GL025227.

Bell, R.E., M. Studinger, M.A. Fahnestock, and **C.A. Shuman** (2006). Tectonically controlled subglacial lakes on the flanks of the Gamburtsev Subglacial Mountains, East Antarctica, *Geophysical Research Letters* 33, L02504 (2006)

Schutz, B.E., H.J. Zwally, **C.A. Shuman**, D. Hancock, J. DiMarzio (2005). Overview of the ICESat Mission, *Geophysical Research Letters*, 32, L21S01.

Bindschadler, R.A., H. Choi, **C.A. Shuman**, and T. Markus, (2005). Detecting and measuring new snow accumulation on ice sheets by satellite remote sensing, *Remote Sensing of Environment*, 98, 388–402

- Stroeve, J., D. Long, J.C. Comiso T.A. Scambos, and **C.A. Shuman** (2005). Estimation of Glaciers and Sea-ice Extent and their Properties, Chapter 56 - Encyclopedia of Hydrology, M G Anderson, Ed., John Wiley & Sons Ltd.
- Steig, E.J. and 11 others (2005). High-resolution ice cores from US ITASE (West Antarctica): development and validation of chronologies and determination of precision and accuracy, *Annals of Glaciology*, v. 41, 77-84.
- Mann, J.L., S.E. Long, **C.A. Shuman**, W.R. Kelly (2005). Determination of mercury content in a shallow firn core from Summit, Greenland by isotope dilution inductively coupled plasma mass spectrometry, *Water, Air, and Soil Pollution*, 163, 19-32.
- Albert, M. **C.A. Shuman**, Z. Courville, R. Bauer, M. Fahnestock, and T. Scambos (2005). Extreme firn metamorphism: Impact of decades of vapor transport on near surface firn at a low-accumulation glazed site on the East Antarctic Plateau, *Annals of Glaciology*, v. 39, 73-78.
- Scambos, T.A., J.A. Bohlander, **C.A. Shuman**, and P. Skvarca (2004). Glacier acceleration and thinning after ice shelf collapse in the Larsen B embayment, Antarctica, *Geophysical Research Letters*, 31, 18, L18402 (noted in Discover Magazine, January 2005, #1 Science Story of 2004)
- Jacka, J. and 23 others (ISMALSS Committee), (2004). Recommendations for the collection and synthesis of Antarctic Ice Sheet mass balance data, *Global and Planetary Change*, 42, 1-4, 1-15
- Das, S.B., R.B. Alley, D.B. Reusch and **C.A. Shuman** (2002). Temperature variability at Siple Dome, West Antarctica, derived from SSM/I and SSMR brightness temperatures, ECMWF reanalyses, and AWS records. *Annals of Glaciology*, 34, 106-112.
- Shuman, C.A.**, and J.C. Comiso (2002). In situ and satellite surface temperature records in Antarctica, *Annals of Glaciology*, 34, 113-120.
- Fahnestock, M.A., W. Abdalati, and **C.A. Shuman** (2002). Long melt seasons on ice shelves of the Antarctic Peninsula: an analysis using satellite-based microwave emission measurements, *Annals of Glaciology*, 34, 127-133.
- Shuman, C.A.**, and J.C. Comiso (2002). Ice sheet temperature records - Satellite and in situ data from Antarctica and Greenland, *Monitoring an Evolving Cryosphere*, 25<sup>th</sup> Anniversary of NSIDC, *Glaciological Data Report GD-30*, 78.
- Shuman, C.A.**, D.H. Bromwich, J. Kipfstuhl, and M. Schwager (2001), Multi-year accumulation and temperature history near the NGRIP site, north-central Greenland, *Journal of Geophysical Research*, 106, D24, 33853-33866.
- Winebrenner, D.P., R.J. Arthern, and **C.A. Shuman** (2001). Mapping Greenland accumulation rates using observations of thermal emission at 4.5-cm wavelength, *Journal of Geophysical Research*, 106, D24, 33919-33934.
- Shuman, C.A.** and C.R. Stearns (2001). Decadal-length composite inland West Antarctic temperature records, *Journal of Climate*, 14, 9, 1977-1988.
- Shuman, C.A.**, K. Steffen, J.E. Box and C.R. Stearns (2001). A dozen years of temperature observations at the Summit: Central Greenland automatic weather stations 1987-1999, *Journal of Applied Meteorology*, 40, 4, 741-752.
- Fahnestock, M.A., T.A. Scambos, **C.A. Shuman**, R.J. Arthern, D.P. Winebrenner (2000). Snow megadune fields on the East Antarctic plateau: Extreme atmosphere/ice interaction, *Geophysical Research Letters*, 27, 22, 3719-3722.

- Kreutz, K.J., P.A. Mayewski, M.S. Twickler, S.I. Whitlow, J.W.C. White, **C.A. Shuman**, C.F. Raymond, H. Conway, N.A. Nereson, J. McConnell, and K. Taylor (1999). Seasonal variations of glaciochemical, isotopic, and stratigraphic properties in Siple Dome, Antarctica, surface snow, *Annals of Glaciology*, 29, 38-44.
- Shuman, C.A.**, R.B. Alley, M.A. Fahnestock, R.A. Bindschadler, J.W.C. White, J.R. McConnell, and J. Winterle (1998). Temperature history and accumulation timing for the snow pack at GISP2, central Greenland, *Journal of Glaciology*, 44, 146, 21-30.
- Bindschadler, R.A., R.B. Alley, J. Anderson, S. Shipp, H. Borns, J. Fastook, S. Jacobs, C.F. Raymond, and **C.A. Shuman** (1998). What is happening to the West Antarctic ice sheet?, *EOS*, 79, 22, 257, 264-265.
- Jouzel J., R.B. Alley, K.M. Cuffey, W. Dansgaard, P. Grootes, G. Hoffmann, S.J. Johnsen, R.D. Koster, D. Peel, **C.A. Shuman**, M. Stievenard, M. Stuiver and J.W.C. White (1997). Validity of the temperature reconstruction from water isotopes in ice cores, GISP2-GRIP Compendium Volume, *Journal of Geophysical Research*, 102, C12, 26471-26488.
- Shuman, C.A.**, R.B. Alley, M.A. Fahnestock, P.J. Fawcett, R.A. Bindschadler, S. Anandakrishnan, and C.R. Stearns (1997). Detection and monitoring of annual indicators and temperature trends at GISP2 using passive microwave remote sensing data, GISP2-GRIP Compendium Volume, *Journal of Geophysical Research*, 102, C12, 26877-26886.
- Alley, R.B., **C.A. Shuman**, D.A. Meese, A.J. Gow, K.C. Taylor, K.M. Cuffey, J.J. Fitzpatrick, G. Spinelli, G.A. Zielinski, M. Ram, P.M. Grootes, B. Elder (1997). Visual-stratigraphic dating of the GISP2 ice core: basis, reproducibility, and application, GISP2-GRIP Compendium Volume, *Journal of Geophysical Research*, 102, C12, 26367-26381.
- Fawcett, P.J., A.M. Ágústsdóttir, R.B. Alley, and **C.A. Shuman** (1997). The Younger Dryas termination and North Atlantic deepwater formation: Insights from climate model simulations and Greenland ice core data, *Paleoceanography*, 12, 1, 23-38.
- Shuman, C.A.**, M.A. Fahnestock, R.A. Bindschadler, R.B. Alley, and C.R. Stearns (1996). Composite temperature record from the Greenland summit, 1987-1994: Synthesis of multiple automatic weather station records and SSM/I brightness temperatures, *Journal of Climate*, 9, 6, 1421-1428.
- Alley, R.B., R.C. Finkel, K. Nishiizumi, S. Anandakrishnan, **C.A. Shuman**, G.R. Mershon, G.A. Zielinski, and P.A. Mayewski (1995). Changes in continental and sea salt atmospheric loadings in central Greenland during the recent deglaciation, *Journal of Glaciology*, 41, 139, 503-514.
- Shuman, C.A.**, R.B. Alley, S. Anandakrishnan, J.W.C. White, P.M. Grootes, and C.R. Stearns (1995). Temperature and accumulation at the Greenland Summit: Comparison of high-resolution isotope profiles and passive microwave brightness temperature trends, *Journal of Geophysical Research (Atmospheres)*, 100, D5, 9165-9177.
- Shuman, C.A.**, R.B. Alley, S. Anandakrishnan, and C.R. Stearns (1995). An empirical technique for estimating near-surface air temperatures in central Greenland from SSM/I brightness temperatures, *Remote Sensing of Environment*, 51, 245-252.
- Kapsner, W.R., R.B. Alley, **C.A. Shuman**, S. Anandakrishnan, and P.M. Grootes (1995). Dominant influence of atmospheric circulation on snow accumulation in Greenland over the past 18,000 years, *Nature*, 373, 6509, 52-54.

**Shuman, C.A.** and R.B. Alley (1993). Spatial and temporal characterization of hoar formation in central Greenland, *Geophysical Research Letters*, 20, 23, 2643-2646.

**Shuman, C.A.**, R.B. Alley, and S. Anandakrishnan (1993). Characterization of a hoar-development episode using SSM/I brightness temperatures in the vicinity of the GISP2 site, Greenland, *Annals of Glaciology*, 17, 183-188.

Alley, R.B., D. Meese, **C.A. Shuman**, A.J. Gow, K. Taylor, M. Ram, E.D. Waddington, and P.A. Mayewski (1993). Abrupt accumulation increase at the Younger Dryas termination in the GISP2 ice core. *Nature*, 362, 6420, 527-529.

## **SELECTED ACTIVITIES/ACHIEVEMENTS**

AGU Cryosphere Focus Group, Executive Committee Member, 2004-Present.

Group Award, Peer Award, Special Act Awards, 2002, 2004, 2005 for ICESat Mission, Education and Outreach, and Field Work, Science Data Processing, and Mission Development, NASA Goddard Space Flight Center

American Geophysical Union Special Session Co-Convener and Co-Chair, ICESat Mission, Fall AGU Meeting, 2003-2005.

American Geophysical Union Special Session Co-Convenor and Co-Chair, Ice Cores: Paleoclimates and Glaciology, Spring AGU Meeting, 1996-2004.

Mentioned in some detail in both R.B. Alley's 'Two Mile Time Machine' (2000) and P.A. Mayewski's 'The Ice Chronicles' (2002) books for contributions to ice core science.

Polar DAAC Advisory Group (PoDAG) Member, 1995-Present, NASA Advisory Panel.

American Meteorological Society, Polar Meteorology Committee member, 2001-2003

International Glaciological Society, Local Committee Member, International Symposium on Remote Sensing in Glaciology, University of Maryland, College Park, June 4-8, 2002.

Member, 1999-2001, NSF's Ice Core Working Group, in support of the National Ice Core Laboratory, West Denver, CO.

National Research Council Resident Research Associateship, 1994-1996, NASA Goddard Space Flight Center, Greenbelt, MD.

Field work: Greenland - 1992, 1995, 1997, 1998, 1999, 2001, and 2006 'summer' seasons (varying durations and accommodations).

Field work: Antarctica - 1996, 1997, 2000 (2x), and 2002 (2x) 'summer' seasons (varying durations and accommodations).